WASHINGTON
SCIENCE TRENDS

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Vol. III No. 7 November 2, 1959

Air-Launched Satellites

An important new program to develop combat satellites and satelloids has won Defense Department approval and will be expedited by the Navy, with the first instrumented launching scheduled for the next two months. Some Navy experts believe such a satellite is already in orbit.

First full-scale experiment in the air-launched satellite field was carried out over a year ago, according to well-qualified Pentagon sources. They told SCIENCE TRENDS that the launching was accomplished by a Douglas F4D Skyray, a carrier based jet interceptor, at the apex of a 40,000 foot high-speed climb. Solid propellant rockets were used to provide the additional thrust necessary to achieve satellite velocity. Although there is ample evidence that an orbit was achieved there has been no definite proof, and the project was never publicly disclosed.

Future program calls for the launching of 180-pound tactical combat payloads from high-speed Naval aircraft. These would either be satellites, designed for low-level fairly lengthy orbits, or satelloids, designed to re-enter the atmosphere after several turns around the earth.

Concept would provide carrier-based aircraft with the capability of launching payloads for a variety of tactical battle applications. These include various types of electronic surveillance systems, communication systems, electronic counter-measure systems, as well as combat intelligence systems which could inform a fleet commander as to what enemy radar installations were operating, or what enemy communication channels were in use at a particular time.

For some types of missions a fairly short-lived orbital period would suffice, for others, it is believed a satelloid which could return a payload for recovery at sea would be more desirable.

The program, if it should prove successful, could constitute another important set-back to the Air Force in its campaign to assume jurisdiction over all military space ventures. As previously reported, the Air Force has already lost, at least for the present, its campaign to control such military space payloads as Communications, which has been assigned to the Army, and Navigation, which has been assigned to the Navy. The Air Force has also lost out in its attempts to control the super-boosters such as the Saturn, which is now a responsibility of the civilian National Aeronautics and Space Administration.

Space Secrets -- An Editorial

National Aeronautics and Space Administration, annoyed at Soviet space accomplishments, and somewhat embittered by U.S. public criticism, appears to be reacting in a typical Washington fashion - imposing greater secrecy on most of its operations.

NASA's public information staff is under orders not to disclose forthcoming experiments. The orders came from Administration officials sensitive to complaints that tests have been overpublicized. Policy was highlighted by the completely unnecessary secrecy surrounding test launching of a 100 foot inflatable sphere at Wallops Island, Va., during the past week. The experiment startled millions along the East Coast, caused an air-defense jet scramble, surprised commercial pilots and the Federal Aviation Agency and jammed radio-tv-newspaper and police circuits. NASA was fortunate that no tragic results were reported.

NASA contracts are also under tight new secrecy regulations. Announcements of awards, even basic-research contracts to non-profit institutions, are made but once a month. These announcements are limited at times to unintelligible three or four word titles, making it increasingly difficult to report NASA programs and progress.

This hesitancy might be understandable if the U.S. were holding some sort of lead in space ventures which it was anxious to keep. However, the Agency is scrambling to keep pace with Soviet accomplishments and it is difficult for many to understand the advantages of keeping information from others in the U.S. who might be of assistance if they had further knowledge of programs and policies.

Strangely, this policy does not appear to extend beyond the immediate future. While next week's launchings are closely guarded state secrets NASA scientists and engineers are permitted free flights of fancy in public statements, speeches and technical presentations regarding more distant plans. Recent NASA demonstrations, press releases and photographs of proposed vehicles to Mars underscore this point.

The rather thin-skinned sensitivity of top NASA officials was clearly demonstrated recently in connection with a rather scholarly report-proposal for a national space program compiled by the Jet Propulsion Laboratory of the California Institute of Technology. After a delay of several months NASA began to make the lengthy study available upon request. (SCIENCE TRENDS, SEPT. 14, 1959). However, when top NASA officials learned of this they declared the entire document "obsolete" and withdrew all copies from circulation. Apparently, the proposals were somewhat embarrassing. However, the result of this order has been that scientists and engineers who could benefit from the extensive technical background and information in the report have been prevented from doing so.

Amost forgotten today is the mandate of Congress in setting up NASA. The legislators insisted that all information not involving the national security should be made a matter of public record. NASA officials, however, appear to have shackled a highly capable information staff which has been attempting to put some meaning into the Congressional freedom-of-information order.

* Amphibious Vehicle Control

Tracked Landing Vehicles (LVT's) can be successfully operated by remote control, according to tests conducted by the Navy for the Marine Corps. System used is a modified version of one developed by Lear Inc., for Army Ordnance.

Tests in high surf demonstrated efficient remote control operation from a helicopter, from another vehicle and from a ground station.

System Description: According to the Navy, throttle and steer functions are proportionally controlled by a control stick placed in the center of a controller, about the size of a standard typewriter. Moving the stick beyond the idle throttle mark applies the brake. All other functions are momentary "beep" functions controlled by simple push-buttons. So that the remote control operator is aware at all times of the vehicle status, the last button depressed in each function area remains aglow.

Radio link does not appear to be critical, according to the Navy. Tests to date have used the FM Tactical radio sets normally assigned to Fleet Marine Force units. Any interruption of the radio link carrier causes the throttle to return to idle and the brake to be applied --- a fail-safe feature to prevent a run-away vehicle.

Future Applications: Navy Bureau of Ships envisions a number of possible future tactical applications. These include:

* Minefield clearance operations, or the use of a remote-controlled LVT as a lead vehicle in a mechanized column when advancing along a route that may be mined.

* Use of a remote-controlled LVT armed with machine guns for probing enemy installations, or use as a mobile flame thrower, fire extinguisher or smoke generator.

* Use as a supply vehicle, either to conserve manpower, or to carry equipment through areas contaminated by CBR - chemical, biological or radiological warfare.

* Nuclear Process Heat

Industry appears to favor further development of process heat reactors designed to produce steam for various industrial applications. Sentiment expressed at a recent Commission-sponsored symposium show a preference for so-called cooperative projects in which the AEC provides financial research and development assistance, with industry contributing to construction costs. Without Government assistance, it was estimated the economic nuclear process heat would take 10 to 20 years to develop.

Only 67 of 200 industry representatives and others responded to the Commission survey, but their answers are nevertheless going to have an important effect.

On the technical aspects, 35 respondents suggested that steam production at pressures up to 250 pounds per square inch such should be stressed. Another 26 suggested the 250 to 600 psi range. Output in the 100,000 to 250,000 pounds per hour range was generally recommended.

Wingless Jet Transport

National Aeronautics and Space Administration (NASA) is conducting studies of a novel jet transport plane designed to cruise at high subsonic speeds at very low altitudes. Preliminary wind tunnel results appear promising.

Design: Model under test consists of a normal transport-type fuselage with conventional tail surfaces at the rear. However, where the wings normally would appear there are 12 simulated jet engines. Four of these engines are in the nacelles and eight are mounted in turntables recessed into the sides of the fuselage with retractable inlet doors. Both the turntables and nacelles could be rotated to a vertical attitude for vertical take-off and landing (VTOL) or for hovering flight.

Tests: Preliminary wind tunnel investigation at Langley (Va.) Research Center indicate satisfactory static longitudinal and lateral stability. Maximum trimmed lift-drag ratio is said to be close to the lift coefficient for high subsonic speeds at sea level for a full-scale airplane of this type.

Applications: Design studies have previously shown that the use of wings detracts from performance at high-speed and low-altitude. Under such conditions the wingless configuration has the higher lift-drag ratio. A wingless plane would also be expected to ride more smoothly because of its low lift-curve slope. In VTOL applications, according to new NASA studies, such an airplane would have decided advantages. As an assault transport, and for ground attack missions, it is believed, such an airplane would be relatively invulnerable to ground fire.

Gas-Lubricated Bearings

Government agencies are looking with interest upon the development of gas-lubricated bearings which are capable of unusually high-speed operation under extremes of temperature. Other advantages are said to include absence of contamination, low friction, simplicity, reliability and long life.

Symposium sponsored by various Government agencies during the past week heard reports of speeds as high as 165,000 rpm for turbo-compressor units, to 500,000 rpm for a high-speed shaft rotor system currently under development. Conventional oil-bearings generally can go no higher than 100,000 rpm.

Low friction is said to be useful in instruments such as the gyroscope which are characterized by rapid motion. In addition, the reduced friction minimizes heat generation permitting high speed operations not presently possible with conventional lubricants and low cooling capabilities. However, the load capacities of gas bearings are lower than oil bearings -- an important limitation in some applications.

Defense Department reports that applications for gas bearings now being considered call for temperature ranges from about -450°F to perhaps as high as 3,000°F. Projects utilizing oil bearings have generally been limited to temperatures ranging from -60°F to 800°F.

Gas bearings can be used in precision grinders, turbo expanders, gas circulators, experimental rotors for closed cycle gas turbines, air-cycle refrigeration machines, precision measuring instruments, elements of computing machines, and in various other devices.

Research Checklist

( ) Long Distance Communications Systems: The effects of varying the heights of transmitting and receiving antennas on the strength of radio signals received beyond the radio horizon have been determined in a special study by the National Bureau of Standards. A new report sets forth an analysis of measurements of transmission loss at 481mc over a 134-mile path. Signal level recordings were made at antenna heights ranging from 30 to 665 feet. The data is said to be of value in the design of long-distance VHF-UHF communications systems, and in the development and testing of theories of tropospheric scatter communication.

(Report available. 86 pages. $2.25. Write OTS, U.S. Department of Commerce, Washington 25, D.C. for NBS Technical Note No. 6 - An Analysis of Propagation Measurements.)

( ) Open Submersible Motors: Navy studies indicate that corrosion is now the major problem in the design and development of open submersible motors, whose internal parts such as bearings, shaft, rotor and insulation system are impervious to sea water. All parts of the motor are now said to be corrosion-resistant except for the electric steel lamination used for the rotor and stator cores. No available magnetic corrosion steel tested is believed to be applicable.

(For further details, or for submission of information on this problem write Bureau of Ships, Department of the Navy, Washington 25, D.C. Attn: Code 660H)

( ) Fluorine Contamination: National Aeronautics and Space Administration is studying methods for dealing with the hazards of fluorine spills at industrial and research establishments and in areas where fluorine is under study as an oxidant in rocket propulsion systems. Tests have been conducted with water or soda ash as a deluge agent in reducing contamination. In all the tests, from 30 to 43 precent by weight of the released fluoride was captured.

(Report available. 14 pages. Single copies free. Write NASA, 1520 H Street, N.W., Washington 25, D.C. Attn: Code BID for NASA Technical Note D-63)

( ) Liquid Nitrogen-Blood Storage: Office of Naval Research will support studies by the Linde Co., Tonawanda, N.Y., into what may be the first practical procedure for freezing, storing and thawing of whole blood in liquid nitrogen. The process is said to be capable of freezing a pint of whole blood in fewer than 30 seconds, compared to 55 minutes required by conventional methods. Blood can be stored indefinitely, with a high rate of cell preservation. It is estimated that at the present time about $10 million in whole blood is lost each year due to unsatisfactory storage methods.

( ) Missile Signal Interference: Navy is studying the interaction between electromagnetic waves and flames in hopes of determining methods for predicting the interference of rocket exhausts with command, control and telemetry signals. Theoretical plots of absorption, phase shift and reflection have been developed.

(Report to be published in the near future as NRL Report 5388, U.S. Naval Research Laboratory, Washington 25, D.C.)

Publication Checklist

( ) Research and Development Expenditure, a new study by the National Science Foundation outlining 1957 research and development expenditures of private philanthropic foundations and voluntary health agencies. Total for the year is estimated at $95 million. Four pages. Single copies free. (Write Information Office, National Science Foundation, Washington 25, D.C. for Publication NSF -59-55)

( ) Airport Lighting Equipment, a revised booklet listing specific items of airport lighting equipment which have been tested and approved by the Federal Aviation Agency. Supply sources are also given. (Copies available from FAA Regional Offices, Jamaica, N.Y.; Ft. Worth, Tex.; Kansas City, Mo.; Los Angeles, Calif.; Anchorage, Alaska, and Honolulu, Hawaii)

( ) Saline Water Conversion, a Government brochure on the Saline Water Conversion Program, Solar Distillation Program, and the Solar Research Station at Daytona Beach, Fla. Eight pages. 5 cents. (Write Superintendent of Documents, Government Printing Office, Washington 25, D.C. for Pub. No. I 1.87:D 33)

( ) Radioactive Materials, a report on the shipping of radioactive material by the National Reactor Testing Station, Idaho Falls, Idaho. Report is designed to aid in development of improved guides and standards for protection from hazards connected with radioactive material shipments. Fifty-two pages. 30 cents. (Write Superintendent of Documents, Government Printing Office, Washington 25, D.C., for Pub. No. Y 3.At 7:3/6)

( ) Thermal Stresses - Low Cycle Fatigue, a bibliography consisting principally of references pertaining to thermal stresses and low-cycle fatigue in nuclear reactors and power apparatus. References cover Material Test Data, Service Experience and Component Tests, Stress Analysis, Design and related subjects. Twenty-nine pages. $1.50. (Write OTS, U.S. Department of Commerce, Washington 25, D.C., for Knolls Atomic Power Laboratory Report 2048)

( ) Anti-Icing Methods, an Armour Research Foundation report for the Air Force on best chemical and thermo-chemical methods for protection of aircraft against icing. The general problem of ice formation is covered in detail, as are various types of anti-icing systems. Most promising methods are described. 141 pages. $2.75. (Write OTS, U.S. Department of Commerce, Washington 25, D.C. for PB 151 293)

( ) Super-Cavitating Propellers, a 1957 Navy report now released which outlines a design method for super-cavitating propellers and presents results of a number of tests which demonstrate feasibility as a propulsion device for high-speed seacraft. Thirty-eight pages. Microfilm, $3.00. Photocopy, $6.30. (Write Photoduplication Service, Library of Congress, Washington 25, D.C., for David Taylor Model Basin Report C-807)

( ) Satellite Orbit Computations, an Air Force bibliography of titles and brief abstracts of articles dealing with the computation of satellite orbits. June, 1959. Twenty-eight pages. Microfilm, $2.70. Photocopy, $4.80. (Write Photoduplication Service, Library of Congress, Washington 25, D.C., for AFMDC-TR-59-22)